Data Report and Summary Analyses of Non-Sablefish-Endorsed Fixed-Gear Permits

West Coast Groundfish Observer Program

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Photo: NOAA Fisheries, NWFSC

Table of Contents

INTRODUCTION

Overview

This report summarizes discarded catch data collected by the West Coast Groundfish Observer Program (WCGOP) from the limited-entry (LE) non-sablefish-endorsed fixed-gear fishery from January 1, 2006 through April 30, 2007. The WCGOP collects at-sea data from limited-entry trawl and fixed-gear fisheries, as well as from open access nearshore, prawn/shrimp, California halibut, and deep-water fisheries. The WCGOP's goal is to improve total catch estimates by collecting information on the discarded catch (fish returned overboard at-sea) of west coast groundfish species. The data is used in assessing and managing a variety of groundfish species.

West Coast Non-Sablefish-Endorsed Fixed-Gear Fishery

The LE non-sablefish-endorsed fixed-gear fishery is a subset of the limited-entry fixed-gear permits. Of the 231 LE fixed gear permits in 2006 , 67 permits were not sablefish endorsed. The fishery operates primarily out of southern California ports, with the largest concentration (25 permits) operating out of the Los Angeles, California area. The fishery operates year-round but the majority of fishing activity is during the summer months when weather conditions improve. All of the vessels that fish in the non-sablefish-endorsed fixed-gear fishery use longline gear. Vessels that have sablefish-endorsed permits can fish in the non-sablefish-endorsed fishery once their quota of sablefish has been caught. However, only a small percentage of vessels actually do. These vessels are not currently within the WCGOP sampling frame for the non-sablefish-endorsed fishery, only in the sampling frame of the sablefish-endorsed fishery.

Vessels in this fishery range in size from 17 to 60 feet, and average 34 feet. The vessels catch a variety of groundfish species, including thornyheads, sablefish, rockfish, and flatfish, primarily off the coast of California. The fleet typically fishes in depths greater than 80 fathoms and may be restricted to even greater depths under evolving fishery management. Nearly all of the vessels participating in this fishery deliver their iced catch to fresh fish markets. For example, vessels operating out of Newport Beach, California fish in the early morning hours and arrive back to port around 6:00 AM to sell their fish to local restaurants or markets. These vessels retain only the portion of their catch that is marketable and permitted to be landed. The portion of catch which is not marketable or which regulations prohibit landing is discarded at-sea. This is a very market driven fishery, so fishers may discard certain size fish or certain species to maximize the value of their landed catch.

Non-sablefish-endorsed fixed-gear permits are subject to daily and weekly trip limits for sablefish, thornyheads, and other species. From 2006 through early 2007, daily landing limits ranged from 300 to 500 pounds for sablefish depending on which area a vessel fished. There was also a weekly option that

provided the opportunity to make a single delivery during a week, up to a threshold that ranged between 900 and 1,500 lbs. Landings made under either of these options were also capped by a two-month limit between 3,600 and 9,000 lbs. The two-month cumulative limit for thornyheads was 10,000 lbs. of longspine thornyhead and 2,000 lbs. of shortspine thornyheads.

Fisheries managers and enforcement officers use state-issued sales receipts, referred to as fish tickets, to monitor fishery landings. This information is transferred to the Pacific Coast Fisheries Information Network (PacFIN) regional database system by state fishery agencies in Washington, Oregon, and California. Unlike the LE groundfish trawl fleet, vessel logbooks are neither required nor routinely collected for the fixed-gear fleet. Fish tickets only provide information on the amount of fish landed. In order to ensure that total catch does not exceed annual Optimum Yield (OY), managers also need discard information for each managed species. One of the best means of acquiring accurate data needed to estimate the amount of discarded catch is through an at-sea observer program.

West Coast Groundfish Observer Program

On May 24, 2001, NOAA Fisheries (National Marine Fisheries Service, NMFS) established the WCGOP in accordance with the Pacific Coast Groundfish Fishery Management Plan (50 CFR Part 660) (66 FR 20609). This regulation requires all vessels that catch groundfish in the United States Exclusive Economic Zone (EEZ) from 3-200 miles offshore to carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making has extended NMFS's ability to require that California and Oregon vessels which only fish in the 0-3 mile state territorial zone to also carry observers. Observers are stationed along the US west coast from Bellingham, Washington to San Diego, California.

Program Goals

The WCGOP's goal is to improve estimates of total catch and discard by observing groundfish fisheries along the US west coast. Originally, the WCGOP focused observer effort in the LE trawl and fixed-gear fisheries. In 2002, the WCGOP began deploying observers in open access fisheries while increasing coverage of the limited-entry trawl fishery. In 2005, the WCGOP increased its coverage of the limited-entry fixed-gear fishery and in 2006, increased coverage of the open access nearshore fishery. Currently, the WCGOP coverage goal is to maintain, at a minimum, 20% coverage of the limited-entry trawl and fixed-gear fisheries by landings, while continuing to expand coverage in the open access fisheries. The observer coverage plan is available at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observersamplingplan.pdf.

METHODS

Permit Selection Process for Limited-Entry Non-Sablefish-Endorsed Permits

LE non-sablefish-endorsed fixed-gear permits are selected for observation using stratified random sampling. First, the WCGOP determines the amount of time (based on available resources) it will take to observe the entire 0-tier fleet; this is termed the selection cycle. The selection cycle varies due to changing priorities and observer resources. Because of the data and timeline requirements for fisheries managers and historical observer program vessel coverage, the selection cycles do not coincide with the date range of the observer data analyzed in this report. The data in this report were collected during two selection cycles, the first from January 1, 2005 through December 31, 2006 (selection cycle 2) and the second from January 1, 2007 through December 31, 2007. In the current selection cycle, there are 66 LE non-sablefish-endorsed fixed-gear permits.

	2005	2006	2007											
	Jan - Dec	Jan - Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Selection Cycle	Selection Cycle 2		Selection Cycle 3											
Report Data		Date Range of Report Data												

The WCGOP aggregates ports along the US west coast into port groups, which are considered strata. Vessels with LE non-sablefish-endorsed fixed-gear permits are assigned to a port group based upon the location of the previous year's landings. Within each port group, vessels are randomly selected for coverage during a two-month period, which coincides with the two-month cumulative trip limit periods. After the entire fleet has been selected, a new selection cycle begins. This selection process is designed to produce a logistically feasible sampling plan with a distribution of observations throughout the entire geographic range of the fishery. Based on this design and the current level of WCGOP funding, the program is currently cycling through the LE non-sablefish-endorsed fixed-gear fleet every one to two years.

For more information on the rational behind vessel selection, see the observer coverage plan at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observersamplingplan.pdf.

Vessel Coverage

The LE non-sablefish-endorsed fixed-gear fleet is WCGOP's third highest priority for observer coverage. Some vessels whose permits are selected for a specific two-month period may not be covered by an observer during that period or may not be covered on all trips during that period. Single trips may be waived from observer coverage due to observer availability, a safety issue that can be fixed in a relatively short period of time, or vessel space issues that arise when an extra person is aboard. A selection cycle waiver allows the vessel to fish without an observer during all trips taken during the

entire selection cycle. Selection cycle waivers are given when a vessel has a serious safety concern that cannot be easily remedied or if the vessel is too small or space is too limiting to safely carry an observer.

Some vessels may receive a coverage period waiver. Coverage period waivers allow a vessel to fish all trips during a two-month period without an observer. Coverage period waivers are given for a variety of reasons, including vessel size/space constraints, observer availability, and vessel safety. Vessels are given a coverage period waiver for a specific two-month time period. These vessels are added to the selection list for the next two-month period. For instance, if a vessel is given a coverage period waiver for January 1 through February 28, that vessel is automatically selected for observer coverage for the period March 1 through April 30. Vessels continue to be added to subsequent selection lists until either an observer covers them or until the selection cycle ends, whichever comes first.

Fixed-Gear Data Collection

Fisheries observers are trained professionals who monitor and record catch data on commercial fishing vessels by following protocols in the WCGOP Manual (NWFSC 2006, current manual available at: http://www.nwfsc.noaa.gov/research/divisions/fram/observer/observermanual/observermanual.cfm).

Data collected by observers on a trip basis include:

- Start time, end time, and location of the set/retrieval of gear
- Gear type and fishing strategy
- Fish ticket identification numbers

Data collected by observers on a set basis include:

- Estimated total catch weight (including sets for which there is 100% discard)
- Weight of discard by catch category
- Reason for discard by catch category or species
- Species composition of discard by catch category
- Weight of fish retained by catch category
- Species composition of fish retained by catch category
- Catch of prohibited species and incidental take of protected species
- Size composition, tags, and viability assessments for Pacific halibut
- Size composition of discarded fish
- Basic taxonomic composition of non-fish bycatch
- Special biological collections (otoliths, maturity, food habits, genetic samples, etc.)

For more information regarding observer sampling on LE non-sablefish-endorsed fixed-gear vessels, refer to the WCGOP Observer Training Manual, Chapter 5 – Fixed Gear Sampling at: http:// www.nwfsc.noaa.gov/research/divisions/fram/observer/observermanual/ observermanual.cfm.

Data Quality Control and Management

The WCGOP uses the following procedure to ensure that the quality of the data collected is maintained:

1. Data are collected at-sea by the observer following protocols in the WCGOP Manual (NWFSC 2006).
2. Data are entered into the database system. The data are entered into a centralized Oracle database located at the Northwest Fisheries Science Center (NWFSC). Data within the Oracle database are accessible via a web-based GUI or by direct SQL queries to the database. A list of data tables is located in Appendix A.
3. Observers are debriefed by WCGOP staff after every two-month cumulative trip limit period. The debriefing includes:
    A. Calculation, Data Form, and Sampling Methodology Checks – Observers send data to a debriefer on a monthly basis. The debriefer checks all calculations for accuracy, reviews data forms for completeness, and ensures appropriate sampling methodologies were employed.
    B. Observer Logbook Review - Observers keep logbooks detailing the events of each trip, basic deck schematics, sampling methods used, communication logs, and confirmation of a current safety decal. Any sets during which sampling problems occurred are documented in the logbook and reviewed during debriefing.
    C. Interview – The observer is interviewed by the debriefer. During the interview, sampling methodologies employed on all trips are discussed and data errors are updated.
    D. Evaluation - Observers are evaluated on their performance based upon WCGOP generated criteria.
    E. Data Entry Check - Electronic data are compared to the raw data for keypunch errors. Also, all corrections discovered during debriefing are updated in the database program.
4. Database Quality Control Queries - Quality control queries are run to detect data that fall outside specified ranges and identify other inconsistencies between data elements. These database quality control queries are run every six months to a year on all data collected during a specified time period.
5. Database Update - The raw data from all entries that are highlighted by the QC queries are reviewed and the electronic data are updated.

Data Processing

Data processing includes the following steps: expand the subsample of species composition to the set-level; translate observer species codes to the appropriate PacFIN fish ticket data codes; identify and select the observer data records to match to fish tickets; query and process PacFIN fish ticket data associated with the LE non-sablefish-endorsed fixed-gear fishery including the observed trips; and then

merge observer data and fish ticket data. The translation of species codes allows a more seamless match with fish ticket data and to provide information for observer coverage of overall fishery landings.

The WCGOP database administrator expands the subsamples of catch categories to the set level. In cases where the observer was only able to sample a portion of a set, a set-level expansion is needed to estimate the total retained and discarded weight. The following equation is used to calculate the weight of the retained and discarded catch of each species in a set:

$$X_i = x_i \frac{H}{h}$$

where

X_i = the calculated weight of species *i* in the set,
x_i = observed weight of the species *i* in the subsample,
h = the number of hooks sampled in a set,
H = the total number of hooks in a set.

Once the set-level expansion is complete, a data file that includes all fields necessary for the analysis is produced.

Only the retained catch from trips with all sets sampled are required for the process of matching observer data to fish ticket data. The data records not required for matching the data to the fish tickets are removed from the data file for the matching process. The records that are removed and contain sampled catch data are added back into the data file prior to the coverage and discard rate analysis. Data that meets the following criteria are removed for the fish ticket matching process:

- Data where WCGOP data quality standards are not met. (These data are only used for the coverage rate analysis).
- Trips with sets where no retained or discarded information is recorded.
- Sets where observed total catch weight = 0.
- All discarded catch information. (These data are added back in for the discard analysis.)
- Trips where no fish ticket could be found. (These data are added back in for the coverage rate and discard rate analyses.)
- Partial trips (trips where the vessel was observed for less than 100% of their landed catch). (These data are added back in for the coverage rate and discard rate analyses.)

Next, the translation step of the process adds coding to the observer data that allows for the appropriate match to the coding system used to record data on fish tickets.

Once these two steps are completed, the retained catch records from the WCGOP data are merged with fish ticket data to provide more accurate estimates of retained catch. Fish tickets are trip-aggregated sales receipts for marketable species/categories. Fish ticket information is uploaded from state databases into the regional PacFIN database on a monthly basis and is subject to update frequently thereafter. The WCGOP data are linked to fish tickets by direct fish ticket number(s) obtained by the

observer and/or by comparing the return date recorded by the observer with the dates of fish tickets from the vessel. For trips with multiple fish tickets, the fish ticket data are combined for analysis purposes. For trips with missing fish tickets, the WCGOP data are not adjusted.

The WCGOP data are adjusted so that the total trip pounds of retained fish in a catch category (as recorded by the observer) matches the total trip pounds on the fish ticket, because the fish ticket weight is often more accurate. To match the total trip pounds, the weights within each observer retained catch category are scaled up or down by the ratio of fish ticket and observer trip weights for that category, using the following equation to calculate the adjustment factor:

$$A_{jkm} = x_{jkm} \Big/ \sum_{k} x_{jkm}$$

where

x_{jkm} = lbs in catch category j in set k in trip m

A_{jkm} = adjustment factor used for catch category j in set k in trip m.

The equation used to adjust the WCGOP data is:

$$x_{jkm} = A_{jkm} \cdot C_{jm}$$

where

C_{jm} = lbs in catch category j for trip m recorded on the fish ticket.

When a catch category in the WCGOP data cannot be matched to a fish ticket species category, the WCGOP data are not adjusted.

Catch categories found only on the fish tickets are distributed across the observed sets using the proportion of the observed catch per set divided by the total observed catch per trip using the following equation:

$$B_{km} = \text{Total weight per set} \big/ \text{Total weight per trip} = \sum_{j}\sum_{i} x_{ijkm} \Big/ \sum_{k}\sum_{j}\sum_{i} x_{ijkm}$$

$$C_{jkm} = B_{mk} \cdot C_{jm}$$

where

B_{km} = the proportion of observed catch in set k in trip m

C_{jkm} = lbs in catch category j for set k in trip m recorded on the fish ticket.

Upon completion of the observer data merge and adjustment with fish ticket data, the data that had been previously removed for the matching step are then incorporated back into the data file for analysis.

Analysis

Bycatch rates were calculated for a particular species as pounds per unit effort, pounds discarded per one-hundred pounds of sablefish retained, and pounds caught (retained plus discarded) per one-hundred pounds of retained sablefish. The ratio estimator technique (Cochran 1977) was used to estimate

bycatch and discard rates for 35 selected species or species groups. The fish species selected for estimation were all of the stocks currently managed under rebuilding plans, prohibited species in this fishery (salmon, Pacific halibut), and other assessed stocks. The ratio estimates (R_{ij}) were calculated by area (i) and depth range (j):

$$R_{ij} = \sum_t y_{ijt} \Big/ \sum_t x_{ijt}$$

where

y_{ijt} is the discarded or retained pounds of a species in the set t.

Three denominators (x_{ijt}) are presented here: duration in hours of the sampled set t, total catch in pounds of the target species, and total catch of all groundfish in the set t. The first denominator is an un-standardized catch-per-unit-effort for the area-depth stratum. The second and third denominators are used to provide different perspectives for these preliminary analyses.

The variance of R_{ij} is approximated by using the following equation (Cochran 1977):

$$Var(R_{ij}) = \frac{1}{n}\left(\frac{\bar{y}_{ij}}{\bar{x}_{ij}}\right)^2\left[\frac{s^2(y_{ijt})}{\bar{y}_{ij}^2} + \frac{s^2(x_{ijt})}{\bar{x}_{ij}^2} - 2\left(\frac{\sum_t (y_{ijt}-\bar{y}_{ij})(x_{ijt}-\bar{x}_{ij})}{\bar{y}_{ij}\bar{x}_{ij}}\right)\right]$$

where

$\bar{x}_{ij}$ and $\bar{y}_{ij}$ are the means of x_{ijt} and y_{ijt} over the sets and

$s(x_{ijt})$ and $s(y_{ijt})$ are the standard errors of x_{ijt} and y_{ijt}.

Note that Var (R_{ij}) cannot be calculated when $y_{ijt} = 0$ or $x_{ijt} = 0$ for all sets and should be used with extreme caution when R_{ij} is equal to one. This variance estimator was chosen in place of the previously used estimator from Pikitch et al. (1998) because the estimator from Cochran (1977) does not assume independence of the numerator and denominator.

RESULTS AND DISCUSSION

Overall Coverage Levels

Observed and unobserved groundfish catch (in metric tons) landed by the LE non-sablefish-endorsed fixed-gear fishery is summarized by port group in Table 1. Landed catch increased in 2006 relative to 2005 and was distributed over a slightly broader array of port groups. Permits were randomly selected within each port group. The observer coverage of the fishery increased from 3% in 2005 to 7% in 2006. Early 2007 coverage demonstrated a 9% coverage rate, with eight months remaining in the year. One of the reasons for the low coverage rates is that there are a number of vessels that are unable to carry an observer because of vessel size/space constraints or vessel safety. The WCGOP does not place observers on boats less than 18 feet in length.

Spatial Distribution of Observations

The number of observed LE non-sablefish-endorsed fixed-gear trips and sets are summarized in Table 2. Table 2 reports the distribution of coast-wide observed trips among port groups and the number of sets that were observed by general management area strata. The port group assignments in Table 2 represent the port in which the fish were off-loaded from a vessel, not necessarily the port at which the fish were processed. Port-group assignments in Table 1 reflect ports as recorded on fish tickets. Sometimes fish are trucked to a different port following off-loading, which can result in apparent discrepancies between Tables 1 and 2. Los Angeles is consistently the port with the highest landings and number of observed trips. In previous reports, depth strata had been included but only 4 sets in 2006 and 5 sets in 2007 occurred in the shallow strata, so all of the calculations contain data from only the deep strata (> 150 fm). All of the observed sets were south of 40° 10' N. latitude, thus discard rates were only calculated for the south.

It is important to note that the WCGOP controls only the selection of permits for coverage. Fishing activity of the selected vessels can vary in unpredictable ways. Therefore, the program cannot control the percentage of landings or trips that are actually observed.

Discard Estimates

Amounts and rates of discard for 14 species or species groups encountered on observed sets in deep water are summarized by year in Table 3. Overall, thirty-five species groups were examined for discard rate calculations, but only the 14 in Table 3 were caught in observed sets. For each species, the decision to discard is dependent not only upon levels of cumulative retained catch and corresponding landing limits, but also upon the size, condition, and marketability of the fish. For many marketable species, such as sablefish, thornyheads and slope rockfish, retention rates are generally high. In contrast, the rate of dover sole retention is low. Of the groundfish species currently being managed under rebuilding plans, only darkblotched rockfish was caught. There was no observed discard of any rebuilding species by this fishery during the beginning of 2007.

Bycatch ratios for rebuilding species caught during observed sets are summarized in Table 4. Bycatch ratios were not stratified by depth because all of the observed sets occurred in deeper water (> 150 fm south of 40°10' N. latitude). Bycatch ratios are the total weight caught of each species per one-hundred pounds of retained sablefish, thornyheads, slope rockfish, and roundfish. Again, the only instance of rebuilding species bycatch was approximately six pounds of darkblotched rockfish.

As an important component of complex groundfish management, results from the 2006 WCGOP coverage presented in this report can now be utilized in the management process. When combined with additional sources of fishery information, these results can improve total catch estimates for west coast groundfish fisheries.

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APPENDIX A. Oracle Database

Database Table Hierarchy

TRIPS
► FISHING_ACTIVITIES
► FISHING_LOCATIONS
► CATCHES
► SPECIES COMPOSITION
► SPECIES_COMPOSITION_ITEMS
►BIO_SPECIMENS
► BIO_SPECIMEN_ITEMS
► DISSECTIONS

Database Table Descriptions

The database tables listed in the table below are a subset of the total tables contained in the Oracle database. They represent the tables that are actually used to contain the observer data collected by the WCGOP.

BIO_SPECIMENS	Sets of species physical measurements resulting from sampling catches occurring in a haul or set
BIO_SPECIMEN_ITEMS	Physical measurements collected for an individual fish, mammal or bird occurring in a biological sample
CATCHES	PacFIN catch category based on estimates of fish caught during a haul or set
CATCH_CATEGORIES	PacFIN catch categories
DISSECTIONS	Physical specimens collected for an individual fish, mammal or bird
FISHING_ACTIVITIES	Fishing hauls or sets occurring during a trip
FISHING_LOCATIONS	Locations of hauls or sets
PORTS	Coastal cities where fishing activity is based out of
SPECIES	Fish, mammal and bird species that might be encountered during fishing
SPECIES_COMPOSITIONS	Sets of species weights and counts resulting from sampling catches occurring in a haul or set
SPECIES_COMPOSITIONS_ITEMS	Weights and counts for individual species occurring in a species composition sample
TRIPS	Sets of fishing activities that occur between the time a vessel leaves port and when it returns
VESSELS	Trawl, longline, pot or other fishing vessels

Table 1. Observer coverage of groundfish catch landed in metric tons (mt) by non-sablefish-endorsed fixed-gear vessels using longline gear by port group and year, as recorded on fish tickets.

	Not Observed		Observed		Total
Port Group	mt	Percent of unobserved mt by port group	mt	Percent of observed mt by port group	mt
2006					
Astoria	0.3	100%			0.3
Crescent City	25.5	95%	1.4	5%	27.0
Fort Bragg	1.7	90%	0.2	10%	1.9
San Francisco	8.9	93%	0.7	7%	9.6
Monterey	76.7	97%	2.5	3%	79.2
Morro Bay	2.6	100%			2.6
Los Angeles*	153.1	91%	15.4	9%	168.5
Santa Barbara	63.6	95%	3.4	5%	67.0
ALL PORTS	332.4	93%	23.6	7%	356.1
January-April 2007					
Coos Bay	0.3	100%			0.3
Crescent City	4.9	100%			4.9
Fort Bragg	1.8	92%	0.2	10%	2.0
San Francisco	1.2	100%			1.2
Monterey	26.2	93%	2.0	7%	28.2
Los Angeles*	47.9	92%	4.1	8%	52.0
Santa Barbara	9.9	81%	2.3	19%	12.2
ALL PORTS	92.1	91%	8.6	9%	100.7

*Los Angeles includes all ports in Los Angeles,Orange and San Diego counties.

Table 2. Number of observed limited-entry non-sablefish-endorsed fixed-gear trips and sets using longline gear by year, port group, and management area.

2006

AREA	Number of trips	Percent of trips in port group	Number of sets
SOUTH			185
Port Group			
Fort Bragg	1	1%	
San Francisco	2	2%	
Monterey	7	6%	
Los Angeles*	101	86%	
Santa Barbara	7	6%	
ALL PORTS	118	100%	

January-April 2007

AREA	Number of trips	Percent of trips in port group	Number of sets
SOUTH			62
Port Group			
Fort Bragg	1	2%	
Monterey	6	13%	
Los Angeles*	29	64%	
Santa Barbara	9	20%	
ALL PORTS	45	100%	

*Los Angeles includes all ports in Los Angeles, Orange and San Diego counties.

Table 3. Discard rates for species from observed limited-entry non-sablefish-endorsed fixed-gear longline sets deeper than 150 fathoms south of 40° 10' N. latitude by year.

	2006		Jan-Apr 2007	
Species	Pounds	Percent	Pounds	Percent
Darkblotched Rockfish				
Discarded	5.6	88%		
Retained	0.8	12%		
Total Catch	6.4	100%		
Lingcod				
Discarded				
Retained	7.5	100%		
Total Catch	7.5	100%		
Dover Sole				
Discarded	366.5	78%	184.2	93%
Retained	100.8	22%	14.9	7%
Total Catch	467.3	100%	199.1	100%
Longspine Thornyhead				
Discarded	1,053.9	38%	197.8	21%
Retained	1,710.6	62%	757.4	79%
Total Catch	2,764.6	100%	955.1	100%
Shortspine Thornyhead				
Discarded	3,489.1	12%	441.7	5%
Retained	26,648.0	88%	8,206.2	95%
Total Catch	30,137.0	100%	8,647.9	100%
Mixed Thornyheads				
Discarded	105.7	2%		
Retained	5,737.1	98%	882.0	100%
Total Catch	5,842.8	100%	882.0	100%
Sablefish				
Discarded	1,495.3	10%	6,330.7	58%
Retained	13,764.2	90%	4,515.8	42%
Total Catch	15,259.5	100%	10,846.4	100%
Pacific Hake				
Discarded	188.2	53%	309.4	22%
Retained	167.0	47%	1,086.8	78%
Total Catch	355.2	100%	1,396.1	100%
Petrale Sole				
Discarded	1.0	100%	1.7	100%
Retained				
Total Catch	1.0	100%	1.7	100%
Other Flatfish				
Discarded				
Retained	12.0	100%	13.0	100%
Total Catch	12.0	100%	13.0	100%
Other Shelf Rockfish				
Discarded	3.3	11%	12.1	5%
Retained	26.4	89%	234.6	95%
Total Catch	29.7	100%	246.7	100%
Blackgill Rockfish				
Discarded	170.7	3%	20.4	1%
Retained	6,130.6	97%	2,721.6	99%
Total Catch	6,301.3	100%	2,742.0	100%
Other Slope Rockfish				
Discarded	8.8	3%	15.4	3%
Retained	334.9	97%	462.9	97%
Total Catch	343.7	100%	478.3	100%
Unidentified Roundfish				
Discarded	226.0	21%	68.0	11%
Retained	836.8	79%	557.0	89%
Total Catch	1,062.8	100%	625.0	100%

Table 4. Ratio estimates and standard errors for the total bycatch of seven overfished species per one-hundred pounds of retained groundfish from observed limited-entry non-sablefish-endorsed fixed-gear longline sets deeper than 150 fathoms south of 40° 10' N. latitude by year.

	2006			January-April 2007		
Species	Number of sets	Catch/100 lb	se	Number of sets	Catch/100 lb	se
Bocaccio Rockfish	185	0.000		62	0.000	
Canary Rockfish	185	0.000		62	0.000	
Cowcod Rockfish	185	0.000		62	0.000	
Darkblotched Rockfish	185	0.3088	0.2734	62	0.000	
Pacific Ocean Perch	185	0.000		62	0.000	
Widow Rockfish	185	0.000		62	0.000	
Yelloweye Rockfish	185	0.000		62	0.000	